

Appln. No. 10/789,498
Amendment dated May 24, 2005
Reply to Office Action of March 3, 2005

REMARKS/ARGUMENTS

Reconsideration of the present application, as amended, is respectfully requested.

The March 3, 2005 Office Action and the Examiner's comments have been carefully considered. In response, claims are amended, and remarks are set forth below in a sincere effort to place the present application in form for allowance. The amendments are supported by the application as originally filed. Therefore, no new matter is added.

CLAIM AMENDMENTS

Claims 1, 4 and 6 are amended to correct inadvertent typographical and/or grammatical errors. The amendments to claims 1, 4 and 6 are not related to the patentability of these claims.

PRIOR ART REJECTIONS

In the Office Action, claims 1, 3, 4, 6 and 7 are rejected under 35 USC 103(a) as being unpatentable over USP 5,442,274 (Tamai) in view of USP 5,654,622 (Toya et al.). Claims 2 and 5 are rejected under 35 USC 103(a) as being unpatentable over Tamai

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in view of Toya et al. and further in view of USP 6,246,890 (Sato et al.).

The present claimed invention as defined by independent claim 1 is directed to an AC adapter (10A) for use in charging a secondary battery (21) which is contained in or mounted on a main body (20). The AC adapter includes a primary side circuit (31) for turning, by using a switching element (33), an input DC voltage applied to a primary winding (N_p) of a transformer (T) on and off. The AC adapter also includes a secondary side circuit (41) for rectifying and smoothing an AC voltage induced in a secondary winding (N_s) of the transformer (T) to produce an adapter voltage (V_{ADP}), a voltage control circuit (42A) for detecting a variation of the adapter voltage to produce a voltage control signal, a constant current control circuit (43) for detecting a charging current (I_c) flowing in the secondary side circuit to produce a constant current control signal, a photocoupler (PC) for feeding the voltage control signal and the constant current control signal as a feedback signal back to the primary side circuit, and a switching control circuit (32) for controlling, in response to the feedback signal, on and off of the switching element (33). The AC adapter also includes detection circuit (45), disposed in the secondary side circuit, for detecting that the charging current (I_c) decreases less than

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a set current value to produce a detected signal, whereby the voltage control circuit (42A) operates so as to have repeated operations including the steps of gradually lowering the adapter voltage (V_{ADP}) and increasing, in response to the detected signal, the adapter voltage (V_{ADP}) by a predetermined voltage.

In the Office Action the Examiner admits that Tamai does not expressly disclose the limitations set forth in the last five lines of claim 1. In order to bridge the gap between the present claimed invention as defined by claim 1 and Tamai, the Examiner cites Toya et al.

In the Office Action the Examiner asserts that Toya et al. disclose a voltage control circuit which repeatedly operates comprising the steps of gradually lowering said adapter voltage and of heightening, in response to said detected signal, said adapter voltage by a predetermined voltage. The Examiner points to column 2, lines 48-62 of Toya et al. to support his assertion.

Applicants respectfully state that Toya et al. do not disclose, teach or suggest the detection means as set forth in claim 1. Column 2, lines 48-62 of Toya et al. recite:

"A first method according to the present invention is a method for charging a secondary battery connected to a protecting circuit. The protecting circuit interrupts the charging of the secondary battery when the battery voltage of the secondary battery reaches a first protecting voltage higher than a first voltage which is the full charge voltage. According to this charging method of the present

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invention, a secondary battery is firstly constant current charged, and then charged till the battery voltage becomes higher than the first protecting voltage so that rapid charging can be achieved. When the secondary battery is charged to such a state, the protecting circuit is prevented from operating by switching over the protecting voltage of the protecting circuit to a second protecting voltage higher than the first protecting voltage."

Based on this disclosure, Toya et al. do not disclose, teach or suggest that the voltage control circuit operates so as to have repeated operations including the steps of gradually lowering the adapter voltage and thereafter increasing the adapter voltage by a predetermined voltage, in response to the detected signal produced by detection means which detect whether the charging current decreases less than a set current value. Toya et al. do not discuss gradually lowering the adapter voltage. Toya et al. only state that the protecting circuit "interrupts" the charging of the secondary battery which is not a gradual lowering of the adapter voltage, but an abrupt lowering. Toya et al. disclose preventing the protecting circuit from operating by switching the protecting voltage to a second voltage higher than the first protecting voltage when the secondary battery is charged. But this teaching does not correspond to increasing the adapter voltage by a predetermined voltage when the charging current decreases less than a set current value as recited in claim 1.

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In view of the foregoing, claim 1 is patentable over Tamai and Toya et al. under 35 USC 102 as well as 35 USC 103.

In the Office Action the Examiner asserts, with regard to claim 6, that Tamai discloses a method of charging, by using an adapter voltage, a secondary battery which is contained in or mounted on a main body. The Examiner states that the method disclosed in Tamai includes the step of: a) gradually lowering said adapter voltage. The Examiner points to column 7, lines 61-64 of Tamai for support.

However, Tamai does not disclose this feature of the present claimed invention. Tamai recites at column 7, lines 61-64

"the op-amp 96A of the constant voltage charging circuit 96 compares the voltage divided battery voltage at its + input terminal with a reference voltage connected with its - input terminal."

There is no mention of gradually lowering an adapter voltage or even lowering the adapter voltage. Accordingly, the cited portion of Tamai does not support the Examiner's assertion that Tamai discloses a method of charging by using an adapter voltage, a secondary battery which is contained or mounted on the main body and a method comprising the steps of gradually lowering the adapter voltage.

In the Office Action, the Examiner admits that Tamai does not teach: b) heightening said adapter voltage by a predetermined

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voltage when a charging current flowing through said secondary battery is less than a set current value; and c) repeating said steps a) and b). In order to bridge the gap between claim 6 and Tamai, the Examiner relies on Toya et al. and points to Fig. 6 and column 2, lines 48-62 of Toya et al. for support.

However, Toya et al. do not disclose these claimed features of the present claimed invention. That is, Fig. 6 of Toya et al. is a graph showing the battery voltage of a secondary battery and the charging current, but does not show the adapter voltage. Moreover, column 2, lines 48-62 of Toya et al. (set forth explicitly above) do not disclose, teach or suggest the steps of the present claimed invention in the manner which is described above (see the arguments set forth above in connection with claim 1).

Accordingly, claim 6 is patentable over the cited references because the references do not disclose, teach or suggest a method of charging, by using an adapter voltage, a secondary battery which is contained in or mounted on a main body, the method including the steps of gradually lowering the adapter voltage, increasing the adapter voltage by a predetermined voltage when a charging current flowing through the secondary battery is less than a set current value, and repeating the steps (see claim 6, lines 4-8).

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Claims 2-5 are either directly or indirectly dependent on claim 1, and claim 7 is dependent on claim 6. Claims 2-5 and 7 are patentable over the cited references in view of their dependence on claims 1 or 6, and because the references do not disclose, teach or suggest each of the limitations set forth in the dependent claims.

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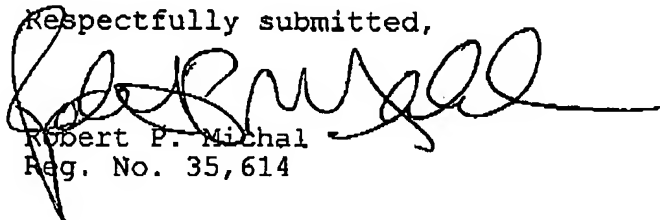
Entry of this Amendment, allowance of the claims and the passing of this application to issue are respectfully solicited.

If the Examiner disagrees with any of the foregoing, the Examiner is respectfully requested to point out where there is support for a contrary view.

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If the Examiner has any comments, questions, objections or recommendations, the Examiner is invited to telephone the undersigned at the telephone number given below for prompt action.

Respectfully submitted,



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